

Vertebral Body Stapling: A Treatment Option for the Growing Child with Scoliosis

Introduction: Because

- Bracing for idiopathic scoliosis is only moderately successful in preventing curve progression
- Bracing carries associated psychosocial ramifications in some adolescents
- I looked for alternative treatments

Shape Memory Alloy Staple

NITINOL

Nickel-Titanium-Naval-
Ordnance-Laboratory

- 50% Nickel
50% Titanium
- Improved pullout
- Constant force after implantation



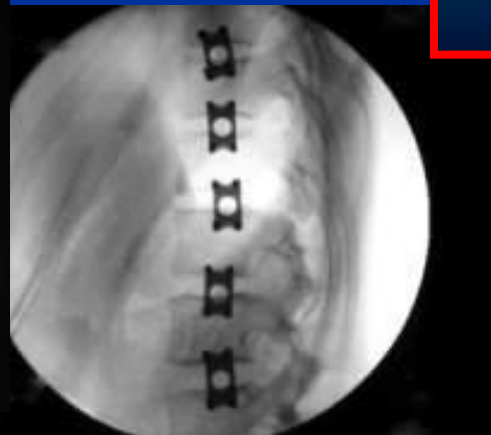
After being in ice bath



After warming to
body temperature



Video



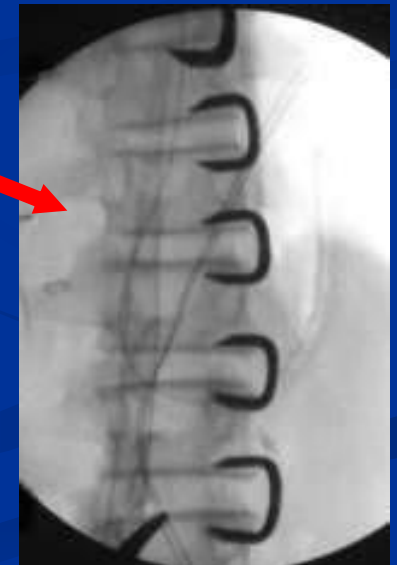
Staples are FDA 510(k) approved for clinician directed applications in the spine, available through Medtronic

Purpose

- To review the results of vertebral body stapling in growing children with idiopathic scoliosis and minimal 2 year follow up

Methods

- Retrospective review
- Inclusion criteria:
 - Idiopathic scoliosis
 - Risser 0 or 1
 - Curves 20- 45°
 - Proportional staples (since 2002)
 - Minimum 2-year follow-up
- Chart and radiographic data were specifically reviewed under an IRB approval by two independent observers



Results

- 29 patients met the inclusion criteria, of whom 28 (96.6%) were available for this study.
 - 13/28 patients had two curves stapled.
- 41 curves (26 thoracic, 15 lumbar)
- Average age: 9.4 years
- Success was defined as 'improved' ($>10^\circ$ less than pre-op) or 'no change' (within 10° of pre-op)



Results: Thoracic Curves

- Thoracic curves measuring $\leq 35^\circ$ pre-op had a 79% success rate.
- Curves measuring $< 20^\circ$ on first erect radiograph had an 86% success rate.
- In patients with thoracic curves $> 35^\circ$, 6/8 progressed past 50° .



12yrs old ,Risser 0
premenarcho



4 yrs P/O



71% of patients with hypokyphosis ($<10^\circ$) showed improvement to a normal sagittal profile.



Results: Lumbar Curve

- Lumbar curves had an overall 87% success rate
- Only 1 patient with a pre-op curve of 40° progressed to 50°
- Five patients lost $> 10^\circ$ of lordosis, but their final lumbar lordosis remained in the normal range

Discussion: Indications

- Age
 - < 13 yrs girls, < 15 yrs boys
- Growth remaining
 - Risser 0 or 1
 - 1 year of growth by wrist x-ray
- Coronal curve < 45
 - Minimal rotation
 - Flexible to < 20
- Sagittal thoracic curve < 40

Discussion: Current Practice

Corollaries

- If thoracic curve measures 35 to 45 and does not bend below 20, then will consider adding posterior rib to spine hybrid construct at same time (do posterior first)
- If curves are not below 20 on first erect film, put child in corrective brace till curve gets below 20



Summary

- Analysis of patients with idiopathic scoliosis with high-risk progression treated with VBS and min. 2-year follow-up shows a success rate of 87% in all lumbar curves up to 45° and in 79% of thoracic curves $< 35^\circ$.

